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APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
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10/501,760

07/19/2004

Guether Hambitzer

2945-173

1108

6449

7590

09/16/2010

ROTHWELL, FIGG, ERNST & MANBECK, P.C.

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WASHINGTON, DC 20005

EXAMINER

CREPEAU, JONATHAN

ART UNIT

PAPER NUMBER

1795

NOTIFICATION DATE

DELIVERY MODE

09/16/2010

ELECTRONIC

**Please find below and/or attached an Office communication concerning this application or proceeding.**

The time period for reply, if any, is set in the attached communication.

Notice of the Office communication was sent electronically on above-indicated "Notification Date" to the following e-mail address(es):

PTO-PAT-Email@rfem.com

<b>Office Action Summary</b>	<b>Application No.</b> 10/501,760	<b>Applicant(s)</b> HAMBITZER ET AL.	
	<b>Examiner</b> Jonathan Crepeau	<b>Art Unit</b> 1795	

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

### Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) OR THIRTY (30) DAYS, WHICHEVER IS LONGER, FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

### Status

- 1) ☒ Responsive to communication(s) filed on 28 June 2010.
- 2a) ☒ This action is **FINAL**.                      2b) ☐ This action is non-final.
- 3) ☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

### Disposition of Claims

- 4) ☒ Claim(s) 1,3-5,7,9-18 and 20-32 is/are pending in the application.
- 4a) Of the above claim(s) 14 is/are withdrawn from consideration.
- 5) ☐ Claim(s) \_\_\_\_\_ is/are allowed.
- 6) ☒ Claim(s) 1,3-5,7,9-12,15-18 and 20-32 is/are rejected.
- 7) ☒ Claim(s) 13 is/are objected to.
- 8) ☐ Claim(s) \_\_\_\_\_ are subject to restriction and/or election requirement.

### Application Papers

- 9) ☐ The specification is objected to by the Examiner.
- 10) ☐ The drawing(s) filed on \_\_\_\_\_ is/are: a) ☐ accepted or b) ☐ objected to by the Examiner.  
Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).  
Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).
- 11) ☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

### Priority under 35 U.S.C. § 119

- 12) ☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).
- a) ☐ All    b) ☐ Some \*    c) ☐ None of:
1. ☐ Certified copies of the priority documents have been received.
  2. ☐ Certified copies of the priority documents have been received in Application No. \_\_\_\_\_.
  3. ☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

\* See the attached detailed Office action for a list of the certified copies not received.

### Attachment(s)

- |   |   |
|---|---|
| 1) <input type="checkbox"/> Notice of References Cited (PTO-892)                    | 4) <input type="checkbox"/> Interview Summary (PTO-413)           |
| 2) <input type="checkbox"/> Notice of Draftperson's Patent Drawing Review (PTO-948) | Paper No(s)/Mail Date. _____                                      |
| 3) <input type="checkbox"/> Information Disclosure Statement(s) (PTO/SB/08)         | 5) <input type="checkbox"/> Notice of Informal Patent Application |
| Paper No(s)/Mail Date _____   | 6) <input type="checkbox"/> Other: _____                          |

## **DETAILED ACTION**

### ***Response to Amendment***

1. This Office action addresses claims 1, 3-5, 7, 9-18, 20-31, and newly added claim 32. Claims 1, 3-5, 7, 9-12, 14-18, 20-31 remain rejected for substantially the reasons of record, and claim 32 is also rejected for these reasons. Claim 13 contains allowable subject matter. Claim 14 remains withdrawn.

NOTE: the amendment filed June 28, 2010 contains an incorrect listing of claims, as follows:

Claim 1 does not contain the recitation “and is inert relative to the electrolyte, its overcharge products, and the active mass” that was added on April 13, 2009;

Claim 6 was previously cancelled but is indicated as active and “previously presented” in the present response;

The amendment made to claim 7 on 4/13/09 is not reflected in the present response.

Applicant is required to provide a correct listing of claims in the next response. In order to expedite prosecution herein, the claims as they were presented on 4/13/09 have been examined, with the exception that claim 1 has been treated as additionally incorporating the subject matter of claim 19, which has now been cancelled.

***Claim Rejections - 35 USC § 103***

2. Claims 1, 3-5, 7, 9, 10, 15-18, and 20-32 are rejected under 35 U.S.C. 103(a) as being unpatentable over JP 60-230367 in view of WO 00/44061. Hambitzer et al (U.S. Patent 6,709,789) is taken as an English equivalent of WO '061 herein.

JP '367 is directed to a secondary rechargeable battery comprising an electrode (2), a separator, and a counter electrode (4) (see abstract). The electrode (2) comprises a conductive substrate and a nonconductive porous layer contacting the substrate. Regarding claims 1 and 7, the porous layer may be made of sintered particles of glass or ceramic, which materials are inherently inert to the other cell components (see page 5 of translation). The pore size of the porous layer is between 10 angstroms to 1 millimeter, preferably 100 angstroms to 10 microns. Regarding claims 1, 20 and 21, during battery operation, lithium is precipitated in the bottom of the porous structure, and the electrode (2) inherently functions as a negative electrode (see pages 7 and 8). Regarding claims 9, 10, 26, and 27, the disclosed glasses and ceramics would inherently possess the claimed melting point and thermal conductivity. Regarding claim 22 and 23, the counter electrode may comprise an intercalation metal oxide such as vanadium pentoxide (see page 6). Regarding claim 32, this claim is treated as a product-by-process claim and is therefore met by the reference (MPEP 2113). In particular, the final electrode structure of JP '367 could have been made by a process that includes the step of "not includ[ing] an in situ forming of a composite with the substrate of the negative electrode," as claimed.

JP '367 does not expressly teach that the particles have a volume proportion of at least 40%, 50%, or 55%, as recited in claims 1, 24, and 25.

However, it is submitted that the disclosures of the reference are believed to fairly suggest the claimed porosity ranges. First, it is noted that the reference teaches “sintered” particles, which implies a relatively dense layer of particles. As would be known to a person of skill in the art, sintering is used to densify powder materials and reduce porosity. Accordingly, the disclosure of sintering would suggest high solid volume fractions of one of ordinary skill in the art. Additionally, the reference discloses the additional techniques of chemical erosion, electrolytic oxidation, and ion sputtering directly on the conductive substrate surface to form the porous layer. The disclosure of these techniques is also believed to fairly suggest the use of relatively dense layers which constitute the porous layer. In particular, the “chemical erosion” technique is believed to be a subtractive etching technique whereby the resulting porosity can be carefully controlled to a relatively low value in the resulting reticulated or matrix-like structure.

JP ‘367 further does not expressly teach that the battery comprises an electrolyte comprising sulfur dioxide, as recited in claim 1. JP ‘367 also does not expressly teach that the electrode comprises particles of a solid salt, as recited in claim 15.

Hambitzer et al. ‘789 teach a nonaqueous electrochemical cell having a positive electrode (3), negative electrode (4), and a separator (5). As shown in Figure 2, the negative electrode comprises a substrate (shown at 4) and a plurality of salt particles (10) located between the separator and the substrate. The salt is preferably an alkali metal halide (see col. 3, line 7). The cell further comprises an electrolyte comprising sulfur dioxide (see col. 6, line 5). A negative active mass, which may comprise Li (see col. 6, line 1 et seq.), is deposited on the substrate and grows into the pores of the salt particles upon charging (see col. 3, line 20). The reference

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further teaches that the salt particles may be provided on a porous carrier material (18) that is in the form of a “carrier body” or a felt, fleece or fabric (see col. 4, lines 38 and 51).

Therefore, the invention as a whole would have been obvious to one of ordinary skill in the art at the time the invention was made because the artisan would find it obvious to use the sulfur dioxide electrolyte of Hambitzer et al. in the battery of JP '367. Initially, it is noted that JP '367 provides no particular restriction on its electrolyte composition. As Hambitzer et al. recognize that a composition comprising sulfur dioxide is suitable for use in lithium batteries, its use in JP '367 would therefore be obvious (MPEP 2144.07).

In addition, regarding claim 15, the artisan would be motivated to incorporate the salt particles of Hambitzer et al. into the porous layer of JP '367. In the abstract, Hambitzer et al. teach that the salt allows the operational safety of the battery to be increased. Accordingly, the artisan would be motivated to incorporate the salt particles of Hambitzer et al. into the porous layer of JP '367.

Regarding claim 16, which recites that the size of the salt particles is much smaller than the solid particles, this subject matter would be rendered obvious based on Hambitzer's disclosure of the salt particles being supported on the inert carrier body, which in JP '367 corresponds to the sintered ceramic particles. Therefore, it would be obvious to use salt particles that are substantially smaller than the sintered ceramic particles. Claims 17, 28, and 29 recite a size ratio of less than 1:2, 1:4, and 1:8, respectively, and would also be rendered obvious. Claims 18, 30, and 31, which recites that the volume of the salt particles is no more than 20%, 10%, or 5%, respectively, of the total solid volume of the porous structure, would also be rendered obvious based on the above considerations in addition to the fact that the skilled artisan

would be guided to maintain the pore sizes of the sintered ceramic particles in the ranges disclosed by JP '367.

Regarding claim 3, although JP '367 does not specify the shape of the sintered particles, it would be obvious to one of ordinary skill in the art to use generally spherical particles in the nonconductive porous layer.

Regarding claim 4, which recites that the porous structure contains at least two fractions of particles having different average particle sizes, this subject matter would also be rendered obvious. The sizes of the particles can be manipulated to affect packing density, and thus porosity, of the porous layer. Accordingly, it would be obvious to use more than one particle size in the sintered particles.

3. Claims 11 and 12 are rejected under 35 U.S.C. 103(a) as being unpatentable over JP '367 in view of Hambitzer et al. as applied to claim 1 above, and further in view of Aihara et al (2002/0102456).

JP '367 does not expressly teach that the particles comprise a carbide or nitride of silicon, as recited in claims 11 and 12.

Aihara et al. is directed to a nonaqueous battery. In [0072] and [0074], the reference teaches an electrode comprising silicon carbide and silicon nitride powders as a filler.

Therefore, the invention as a whole would have been obvious to one of ordinary skill in the art at the time the invention was made because the substitution of one known element for

another would have yielded predictable results to one of ordinary skill in the art at the time of the invention. Accordingly, the use of silicon carbide or silicon nitride as the ceramic of JP '367 would have been obvious to the skilled artisan.

### ***Response to Arguments***

4. Applicant's arguments filed June 28, 2010 have been fully considered but they are not persuasive. Regarding claim 32, Applicant urges that the subject matter of this claim is distinguishable over JP '367. However, as noted in the rejection above, this claim may be interpreted as a product-by-process claim and is therefore met by the reference. It is submitted that the final structure recited in claim 32 may or may not include a composite formation. In Applicant's specification, [0044]-[0045], it is implied that a composite made by mechanical compaction is present as the final product of the present invention. It is submitted that JP '367 discloses a final electrode structure that is not distinguishable from this structure. JP '367 discloses that its structure may be made by processes such as vapor deposition, impregnation and ion plantation as noted by Applicant (thus forming "in situ composites"), but does not appear to be limited to these processes. For the sake of argument, assuming that JP '367 is limited to these processes, the final electrode structure is still not distinguishable from that of claim 32 because claim 32 only requires there to be no composite at a particular moment in time during formation of the electrode, which is not limiting on the structure of the final electrode.

Regarding claim 1, Applicant argues that JP '367 fails to disclose or suggest that "the porous structure is determined by the size and shape of structure-forming solid particles."



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However, it is submitted that the porous structure is inherently determined by the size and shape of the particles, as one of several possible factors. It is noted that there is no limitation in the claim language that states that the porous structure is only determined by the size and shape of the particles, hence, other factors may be present. Should Applicant amend the claims to recite this feature, Applicant is advised that such an amendment would likely raise new issues and entry of such is not a matter of right.

Further regarding claim 1, Applicant states that "No inorganic electrolyte is mentioned at all in JP '367." However, it is submitted that the reference's silence on inorganic electrolytes would not dissuade an artisan from making the combination of JP '367 and Hambitzer et al. as stated above.

In response to the argument that the Office mischaracterizes the Hambitzer reference (i.e., the portion at col. 6, line 57 et seq.), this argument has been carefully considered, however the rejection is still believed to be proper for the following reasons: although Hambitzer et al. disclose there is a possibility of a "thermal runaway" situation based in part on the formation of the  $\text{Li}_2\text{S}_2\text{O}_4$  layer from the reaction of the lithium electrode and the  $\text{SO}_2$  electrolyte, the reference further discloses that this problem is greatly alleviated by the presence of the solid salt. As noted in the rejection above, it is the position of the Office that the skilled artisan would be motivated to use the solid salt of Hambitzer et al. in the electrode of JP '367. Therefore, it is submitted that the possible problems associated with the  $\text{SO}_2$  would be obviated by the inclusion of the salt. Stated another way, the electrolyte composition and solid salt of Hambitzer et al. are disclosed as being suitable for use in lithium batteries, and would provide predictable results when used together in the battery of JP '367. Accordingly, the use of such materials in JP '367 would be

obvious to the skilled artisan. *KSR v. Teleflex*, 82 USPQ2d 1385, 127 S. Ct. 1727 (2007). As such, the rejection is believed to be proper.

### ***Conclusion***

5. Applicant's amendment necessitated the new ground(s) of rejection presented in this Office action. Accordingly, THIS ACTION IS MADE FINAL. See MPEP § 706.07(a). Applicant is reminded of the extension of time policy as set forth in 37 CFR 1.136(a).

A shortened statutory period for reply to this final action is set to expire THREE MONTHS from the mailing date of this action. In the event a first reply is filed within TWO MONTHS of the mailing date of this final action and the advisory action is not mailed until after the end of the THREE-MONTH shortened statutory period, then the shortened statutory period will expire on the date the advisory action is mailed, and any extension fee pursuant to 37 CFR 1.136(a) will be calculated from the mailing date of the advisory action. In no event, however, will the statutory period for reply expire later than SIX MONTHS from the date of this final action.

Any inquiry concerning this communication or earlier communications from the examiner should be directed to Jonathan Crepeau whose telephone number is (571) 272-1299. The examiner can normally be reached Monday-Friday from 9:30 AM - 6:00 PM EST.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Basia Ridley, can be reached at (571) 272-1453. The phone number for the

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organization where this application or proceeding is assigned is (571) 272-1700. Documents may be faxed to the central fax server at (571) 273-8300.

Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see <http://pair-direct.uspto.gov>. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free).

/Jonathan Crepeau/  
Primary Examiner, Art Unit 1795  
September 13, 2010